PATENT SPECIFICATION

588,712

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PROVISIONAL SPECIFICATION

Improvements relating to Lubrication Systems

We, POWER JETS LIMITED, a British Company, of Whetstone Works, Whetstone, Leicestershire, and DANIEL NORMAN WALKER, a British Subject, of the said Company's address, do hereby declare the nature of this invention to be as follows:—

This invention relates to lubrication systems and more especially to systems such as may be applied for example to aero engines or other machinery in which the circumstances of use make it expedient for an oil thinner or diluent to be added to the oil, for example upon stopping or shutting down so as to render the viscosity of the oil more appropriate to the next phase of operation, e.g. starting up from cold. Taking for example existing aero engine practice, the addition of oil diluent is an accepted practice, but usually the means whereby this is done results in an arbitrary quantity of diluent being supplied so that if there are for example a series of short runs and the user follows the routine of injecting diluent at each stop, the lubricating oil as a whole may have its viscosity excessively reduced. Thus an element of personal judgment may be introduced with the possible consequence that forgetfulness or over zealousness may have bad results. The main object of the present invention is to provide means whereby the quantity of diluent supplied is determined by the condition of the lubricant for the time being and also to provide means whereby the injection of diluent is automatic, automatic injection not being undesirable providing it is controlled by the condition of the lubricant.

According to this invention, means are provided for the introduction of a diluent or thinner into a main supply of lubricant and the quantity delivered by such means in any given operation is controlled by the viscosity and/or temperature of the present lubricant. Thus, for example, a diluent pump is provided and its output is connected to a suitable point in the lubrication system, e.g. the tank. This pump may suitably be a small gear pump. The pump is turned by an electric motor through a differential gear, the pump being on one output shaft from this gear. The second output shaft from the gear drives a paddle which is immersed in the lubricant for example at the outlet of an oil tank. The electric motor is controlled by a switch which may be operated by or interlocked with an engine switch or some other control which will normally be used prior to or during shutting down of the engine or machinery. Assuming the electric motor to be running, then the diluent delivery pump will be driven at a rate dependent upon the viscosity of the oil, since the pump rate will be virtually dependent upon the freedom or restraint of the paddle in the oil. The paddle may incidentally agitate the oil in the region where the diluent is introduced so as to ensure mixing. Where it is desired to control the delivery of diluent also thermometrically, a suitable thermometer such as a bulb type is provided in a chosen locality in the oil and this is arranged further to control the delivery of diluent. For example, the thermometer may control either directly or through relay means an outlet valve or a relief valve on the outlet side of the diluent pump; or it may control a friction brake on the paddle shaft, in which case its effect is so to speak the same as the effect of varying the drag of the paddle; or the thermometer may control a time switch which is in the motor circuit and which will break this circuit in a longer or shorter time after starting the motor, according to the oil temperature. The foregoing examples will have indicated the underlying idea of the invention and it will be obvious that there are other ways of applying it and there may be elaborations or variations to meet individual cases. For example instead of obtaining a direct effect of the oil viscosity by means of a paddle, an indirect effect may be utilised to control the delivery of diluent; thus a pressure difference caused by a restriction in a pipe line or a pressure rise across a lubrication pump may by suitable pressure sensitive means be made to control the quantity of diluent injected and in such an arrangement it may be

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found that the temperature effect is also catered for without further thermometric means.

There may also be circumstances in which it is desirable for the device to be in operation continuously so that whenever the lubricated oil exceeds a certain viscosity, diluent is added. In such a case the diluent pump may be driven continuously and the paddle or other viscosity sensitive device may be so adjusted that it only imposes sufficient brake to cause the diluent pump to operate, when the viscosity increases above an unsafe operational limit. In this case the input to the differential may be in the nature of a positive drive from the engine itself.

Dated this 10th day of December, 1943.
For the Applicants,
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COMPLETE SPECIFICATION

Improvements relating to Lubrication Systems

We, POWER JETS LIMITED (in Liquidation), a British Company, of Whetstone Works, Whetstone, Leicestershire, and DANIEL NORMAN WALKER, a British Subject, of the said Company's address, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to lubrication systems and more especially to systems such as may be applied for example to aero engines or other machinery in which the circumstances of use make it expedient for an oil thinner or diluent to be added to the oil, for example upon stopping or shutting down so as to render the viscosity of the oil more appropriate to the next phase of operation, e.g. starting up from cold. Taking for example existing aero engine practice, the addition of oil diluent is an accepted practice, but usually the means whereby this is done results in an arbitrary quantity of diluent being supplied so that if there are for example a series of short runs and the user follows the routine of injecting diluent at each stop, the lubricating oil as a whole may have its viscosity excessively reduced. Thus an element of personal judgment may be introduced with the possible consequence that forgetfulness or over zealousness may have bad results. The main object of the present invention is to provide means whereby the quantity of diluent supplied is determined by the condition of the lubricant for the time being and also to provide means whereby the injection of diluent is automatic, automatic injection not being undesirable providing it is controlled by the condition of the lubricant.

The invention resides primarily in the provision of means for introducing a diluent or thinner into a main supply of lubricant comprising means whereby the quantity or rate of supply of diluent or thinner delivered into the main supply of lubricant is controlled in accordance with the viscosity, or viscosity and temperature, of the lubricant in the main supply. Thus, a pump may be provided for the diluent or thinner and be driven through differential gearing or mechanism by being connected to an output spindle or equivalent thereof, the alternative output spindle or equivalent driving a paddle or the like immersed in the lubricant of the main supply and therefore offering resistance to movement which is dependent on the viscosity of the lubricant, the pump and the paddle being differentially driven by a suitable power source such as an electric motor. Temperature sensitive means may be provided, to control the switching on and off of the electric motor, or to control a valve associated with the supply of the diluent or thinner, or a brake on the paddle spindle, or to give a combination of such functions.

The invention will now be described by way of example, with the aid of the accompanying schematic drawing in which Fig. 1 shows a general arrangement and Fig. 2 illustrates the application of temperature control to the output of the pump.

In Fig. 1, there is indicated the main tank or reservoir 1 for lubricant, with an outlet 1A leading to a delivery pipe connection 1B. The outlet 1A is circular in section and is arranged to house a paddle wheel 2 which is carried on a spindle 3, this being one output spindle from a differential gear assembly 4 which has a second output spindle 5 and a power input spindle 6. On the spindle 3 there may be a brake drum 7 coacting with a brake indicated diagrammatically as 7A. The spindle 5 drives a pump 8 of gear type, which is the pump for diluent or thinner and which delivers into the main lubrication system at a suitable point, or into the tank 1. The spindle 6 is driven by an electric motor 9.

It being assumed that the components are appropriately selected and designed, it will be apparent that with the motor 9 running, either the paddle 2 or the pump 8, or both together, will be driven round, and consequently that the rate of delivery of the pump 8 can be made dependent on the viscous resistance to rotation of the paddle 2 due to its immersion in the lubricant, to the effect that the rate of delivery of the thinner or diluent into the lubrication system can be proportioned to the viscosity of the lubricant in the tank 1.

It is proposed that the motor 9 be controlled primarily by a time-switch (indicated at 9A) which is actuated by any suitable interconnection with other controls, so as to switch the motor on when the engine having the system, is stopped. the motor thereafter running for a selected time. A thermometer, indicated as a bulb 10 in the tank 1, may be provided and its responses can be made to achieve one or more functions. It may, for example, control the period of time for which the motor runs, by connection to the time switch 9A. The thermometer may actuate the brake on the spindle 3. As indicated in Fig. 2, the outlet of the pump 8 may have a taper gag 11 arranged in it, operated by an elastic chamber 12 arranged to be responsive to changes of temperature at 10.

By combining the effects of the viscosity at the time of stopping of the engine to be lubricated, and of the temperature at that time, the viscosity in the cold condition, i.e. at the next start, can in a sense be predicted and the quantity of diluent or thinner injected at stopping made dependent upon such prediction.

The system may obviously be arranged so as to operate in various ways; for example it is not essentially limited to use upon stopping, for it would be quite simple for it to operate during running if the viscosity of the lubricant became excessive, for example in extremely cold conditions, or after prolonged idling.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Means for introducing a diluent or thinner into a main supply of lubricant comprising means whereby the quantity of diluent or thinner delivered or the rate of supply thereto is controlled in accordance with the viscosity, or viscosity and temperature, of the lubricant in the main supply.

2. Means according to claim 1 in which a pump is provided for the diluent or thinner and is driven through differential gearing or mechanism by being connected to an output spindle or equivalent thereof, the alternative output spindle or equivalent driving a paddle or the like immersed in the lubricant of the main supply and therefore offering resistance to movement which is dependent on the viscosity thereof the pump and the paddle being differentially driven by a suitable power source.

3. Means according to claim 1 or 2 in which in addition to comprising means susceptible to the effects of viscosity, temperature sensitive means are also included in the control of the supply of diluent or thinner.

4. A lubrication system including a lubricant reservoir having an outlet to the system to be supplied a rotating paddle wheel or equivalent situated in the reservoir in the neighbourhood of the outlet therefrom and arranged to run wholly or partly immersed in the lubricant, a differential gear having a power input and two output spindles of which one of the output spindles drives the said paddle wheel whilst the other drives a pump governing the supply of diluent or thinner into the lubrication system whilst the input spindle of the differential gear is connected to a source of power.

5. A system as claimed in claim 4 in which the source of power is an electric motor the operation of which is controlled by thermometric means susceptible to the temperature of the lubricant.

6. A system according to claim 4 or 5 comprising further a brake on the paddle wheel spindle operable to control the motion of the paddle wheel and thus to control the output of the pump.

7. Means or system according to any previous claim in which the diluent or thinner is supplied into the main lubricant system by means of a pump the delivery of which is governed by valve means actuated by thermometric means arranged to be susceptible to the temperature of the lubricant.

8. A lubrication system comprising means for introducing a diluent or thinner according to any of the previous claims and constructed and adapted to operate substantially as described with the aid of the accompanying drawing.

Dated this 11th day of December, 1944.
For the Applicants,
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FIG. 1.

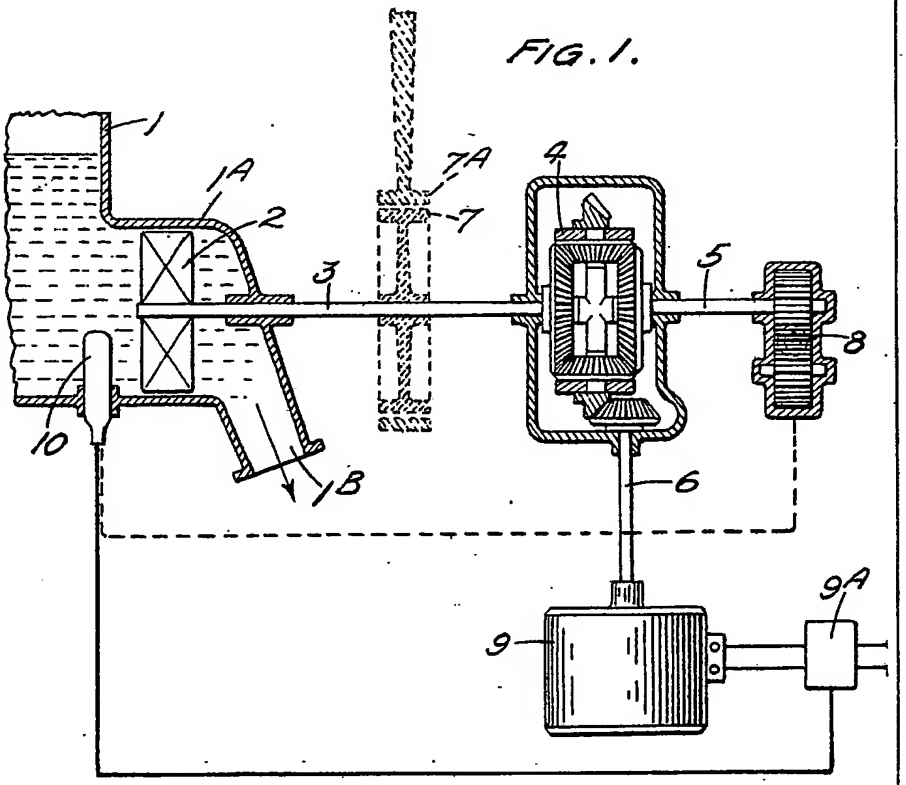
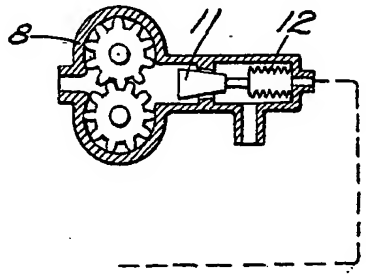


FIG. 2.



H.M.S.O.(Ty. P.)